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AUTHOR Parks, Arlie Muller
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ABSTRACT

The game design procedure outlined in this article assures the designer of an educational game which will help students to learn the material stated in the game's objectives and will provide the teacher with a means of testing the student's ability to meet those objectives. Steps involved in the design are: determining the behavioral objective or objectives of the game, developing a pretest and posttest, making a rough outline of the game content, selecting game format ideas, writing instructions for playing the game, testing the game in an informal situation, and constructing the final form of the game. A great variety of game types may be designed using this technique, and games may be designed for behavioral objectives which have many broad purposes relating to teaching communication, theatre, and the language arts. (JM)

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Developing Educational Games for Use In Speech Communication, Language Arts, and Theatre Courses

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(Ms.) Arlie Muller Parks
Associate Professor of Speech
Mansfield State College
P.O. Box 443
Mansfield, Pa. 16933
717-662-4166 or 717-662-3990

This article explains the steps involved in designing educational games for use as an instructional strategy in the classroom. The unique aspect of the procedure described is the combined use of behavioral (performance) objectives, specifying the particular type of learning involved in meeting the objective, and making use of criterion-referenced testing to determine whether the student has met the behavioral objective. These game design procedures assure the designer of an educational game which will either help students learn the material stated in the teacher's objective, or provide the teacher with a game which can be used to test the students' ability to meet the objective.

Ms. Parks is a doctoral candidate in the Department of Speech Communication, Florida State University.

(approximately 2,820 words)

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CS 501 217

Developing Educational Games for Use in Speech Communication, Language Arts, and Theatre Courses

Arlie Muller Parks

The value of games and simulations as an instructional strategy has been the subject of a seven year research project at Johns Hopkins University Center for Social Organization of Schools.[1] Their research indicates that " . . . the effectiveness of a simulation or game for producing changes in either attitudes or behavior depends on the degree to which it [the game] requires the players to employ knowledge or skills related to the attitude or behavior."[2] Moreover, the designer must build into the winning of the game use of the skills which he hopes his game will foster.[3]

The purpose of this article is to describe a procedure for making educational games to be used as an instructional strategy in speech communication, language arts, and theatre arts courses. The procedure outlined has been successfully used by undergraduate students enrolled in the speech and theatre methods course at Mansfield State College during the 1972-73 and 1973-74 academic years.

The design procedure described here is unique in that it requires the use of performance (behavioral) objectives,[4] Gagné's classification of the levels of learning,[5] and criterion-referenced testing.[6] The combined use of these instructional development tools in the planning and designing of educational

games and simulations provides the game designer with a product which will have specific educational value for the game user. They assure the game designer that his game will require the players to use the skills and knowledge needed to develop the desired learning behaviors.

Educational games can be used for a variety of purposes. The focus of this paper is the design of games for use: A) as a device for testing how well students have met the behavioral objectives over a given content area (which, perhaps, was taught by using a variety of other instructional strategies), or B) as the instructional strategy by which the student will achieve mastery of a specific behavioral objective. An example of a game designed to give both practice in using previously taught communication behaviors and to test those behaviors is "Utopia" by Terri Terescavage. A summary of this game is described in the S.C.A. publication for secondary teachers, Talk Back.[7]

Students in my methods course were given the following objectives for the game design and construction unit.

A. Given a content area in speech or theatre, the student will write at least one behavioral objective which can either:

   (1) be tested by the use of an educational game, or

   (2) be achieved through the use of the instructional strategy of a game.

   Criterion: the entering behaviors, TL (according to Gagné), and the classification of the objective as "productive" or "reproductive" must be correct. The objective must be properly worded, as outlined in

Ed. 300.[9]

B. Given a behavioral objective of his choice in the area of speech or theatre, the student will develop a pre-test for determining:

(1) whether the students possess the entering behaviors necessary to work on the stated objective, and

(2) how closely the students already come to meeting the stated behavioral objective.

Criterion: The pre-test must conform 100% to the requirements for criterion-referenced evaluation as outlined in Ed. 300.[10]

C. Given a behavioral objective of his choice in the area of speech or theatre, the student will develop a post-test to determine if the students meet the behavior objective after playing the educational game.

D. Given all the recources he can locate, a general subject matter area, and a behavioral objective of his choice, the student will develop an educational game which would be appropriate for use in a high school speech and/or drama course. The game will conform to the specifications described in Ed. 300. Criterion for this objective is a grade of at least "C".[11]

Designing the Game

Step One

Since the game or simulation should be designed to test or teach a particular segment of information it is impottant that

the behavioral objective(s), with which the designer is concerned, be written first. The objective(s) may be a productive or reproductive objective; specify which it is. Also determine which of Gagné's eight types of learning the objective requires. Carefully determine the entering behaviors the student must possess in order to meet the objective(s). The entering behaviors for your objective also become the entering behaviors needed to play the game.

Step Two

Now you are ready to develop your evaluation instruments. Two evaluation instruments are needed: 1) a pre-test to determine if the students possess the entering behaviors you have listed and to determine whether they can already meet your objective(s), and 2) a post-test to determine if (or how well) the students have met your objective after they play the game. In many cases two equivalent versions of the same instrument can be developed the satisfy the pre and post-test requirements. (If you use two equivalent versions you should develop a seperate test to be used to determine whether the students possess the entering behaviors needed to meed the objective and to play the game.) Carefully check your evaluation instruments against your behavioral objective(s) so that you are sure that the test tests only information specified in your objective(s). (Ideally, you should run reliability checks on your tests. If you are careful to use criterion-referenced procedures in developing test items you should have content and face validity. You may also wish to run a traditional validity check on the tests.[12] This should be done <u>after</u> you have completed all the steps in

the design procedure.)

Step Three

Make a rough outline of the content you plan to include in the game. This outline should contain the information necessary to meet your objective(s). Check your outline against reliable references. Now double check your outline against your objective(s) and evaluation instruments to be sure that the content of your game includes all the information necessary to meet criterion on your evaluation instrument. If necessary, revise your content outline, evaluation instrument, and/or your behavioral objective(s) so that they are all consistent.

Step Four

At this point you are ready to jot down some game format ideas which you feel will be useful for your objective(s) and content. Be sure that the game format is not too complicated for the type of learning (one of Gagné's eight types) required for the objective(s). Estimate the amount of time necessary to play your game; the time involved in playing should be appropriate for your behavioral objective(s), content, and the type of learning required for your objective(s). Try making several rough drafts of your game using different formats. (This can usually be done on paper.) Come to a decision about the best format for your objective(s), etc.

Step Five

Once you have decided on a format begin to write the instructions for playing your game. Now make a complete rough draft of the entire game, one suitable for temporary use. (This can be

constructed out of 8½ X 11 paper, etc.) Try the game out with a group of friends or students. Revise your instructions, format, etc., as needed until the game plays smoothly. Be sure to check any changes in content against your objective(s) and evaluation instruments.

Step Six

At this point you <u>really should</u> test your game in <u>at least</u> an informal setting. (Those of you who would like to be sure your game <u>is</u> achieving its purpose will want to test it formally. If you plan to have your game published formal testing is a must.) In giving your game an informal test follow these steps: 1) Run reliability and validity checks on your evaluation instruments. 2) Gather some subjects who have <u>not</u> seen your game and give them the entering behaviors test. Then use the subjects whose tests indicate they possess the necessary entering behaviors (or help them acquire the entering behaviors) for your game. 3) Give them the rest of the pre-test. Use the subjects who <u>cannot</u> satisfactorily meet your criterion on the pre-test for the rest of the game testing procedures. 4) Let them play the game carefully following the game instructions. 5) At the completion of the game administer the post-test. 6) Evaluate your results. Did the players meet your original behavioral objective(s), as reflected by their post-test? How closely did they come? If your game does not achieve its purpose revise it again and re-test it.

Step Seven

Once you have satisfactory results from your test your game is ready to be constructed in its final form. The following are

some basic guidelines for the construction of games.

1. Use materials which will hold up under frequent use. Naturally wood, hard plastic, and enamel paints are better than cardboard, poster board, and magic markers. When budgetary or supply problems make it impossible to use the best materials compromise is necessary. Obviously, paper, construction paper, and chalk would be impractical because they would be damaged or destroyed after two or three uses unless they are laminated.
2. Neatness and attractiveness count! If you do not draw or print well get someone else to do the art work, type, use commercial lettering, and use pictures from magazines (lacquer or laminate the pictures). Student interest in using games in increased when the game is attractive.
3. Make your pictures and lettering, etc., large enough to be seen by all the players. Effective typing results can frequently be obtained by using a typewriter with primary letters.
4. Game boards, index cards, mounted pictures, etc., should be laminated. (Check the maximum width your laminating machine will accomodate. Frequently the maximum width is 18 inches.) The laminated surface allows for cleaning the game and also makes it somewhat more sturdy.

Your game is now ready to be named and packaged. Your package

should be sturdy and attractive. The name of your game should be creative and "ear catching".

The educational game should contain a set of instructions and comments for the classroom teacher. (You will want to do this so that your colleagues can share your creative enteprise, and because you may wish to seek publication of your game.) These comments and instructions should include:

1. A list of your behavioral objective(s), complete with the type of learning required by the objective. The objective(s) should be labeled as "productive" or "reproductive" objective(s).
2. A list of the entering behaviors which the players must possess in order to play the game successfully. A statement regarding the age (or grade) levels for which the game would be appropriate.
3. A copy of the pre- and post-test questions (or the appropriate evaluation instruments), and answer key, for evaluating the success of the game.
4. A bibliography of sources which the student would need to consult in order to obtain the knowledge he needs to play the game. In some cases this may be a statement of the pages in your classroom text, the specific lectures you gave your students, a film they have viewed, etc.
5. A copy of all the questions, complete with an answer key, used in the game.
6. The approximate amount of time needed to complete the game.

7. Some brief suggestions for how the teacher might adapt the game for use with a class containing more students than the number of players needed for the game.
8. Suggestions regarding what the audience could or should be doing while the game is being played, so that you are involving as many class members as possible.
9. Although your game is designed for a specific behavioral objective, there are probably a number of other objectives which your game might satisfy. Try to list several additional objectives or uses for your game.
10. A summary of the results of the reliability and validity tests you ran on your game.
11. A bibliography of the sources you used in the preparation of your game. This is especially helpful when you wish to make revisions in your game questions, etc.

Naturally an instruction sheet for the game must be developed. Include the following on the instruction sheet:

1. The number of students the game will accommodate.
2. The rules under which the game is to be played.
3. The directions for playing the game.
4. The scoring system to be used.
5. An indication of how to determine the winner.

If you are thinking of allowing colleagues to share your ideas, or if you think you may wish to have your game published, it would be helpful to include the following items:

1. The total cost of the construction of the game.
2. A brief description of the game and drawings of the board, etc.

3. A description of the apparatus needed to play the game.

Once this has been completed you should have a well designed game which will satisfy educational objectives you deem important for your students.

GENERAL HINTS ON GAME DESIGN

Perhaps the greatest problem encountered by my students was writing a satisfactory behavioral objective for their game. Avoid writing a behavioral objective which begins, "Given the game _____.....". It is preferable to start with a meaningful objective for a lesson, unit, or course. Then develop a game (as a teaching strategy) to either help the student meet that objective, or to test the student to determine if he has already met the objective (after using some other instructional strategy which teaches for the objective).

Remember these additional guidelines when designing your game:

1. It should play quickly and should require the players to remain mentally and physically alert.
2. It should be fun to play, but it must have a purpose. That purpose is either helping the player to achieve your behavioral objective, or testing the player to see if he can already meet your behavioral objective.
3. If the game is a simulation, it should accurately reflect that part of the communication or theatrical system which it represents.
4. If the simulation is used to represent a theory of communication or theatre it should be isomorphic with the theory--an approximation is of little value.

My students and I have found it helpful to look at commercial games and the game shows on television for format ideas. Many of these can be easily adapted for educational purposes.

A variety of types of games can be designed using the technique described in this paper. The following is a short list of some types which come to mind. Following each type is an example of a well known, or commercial game to clarify what I mean.

1. board games (Monopoly)
2. card games (Five Hundred)
3. word games (Hangman's Game)
4. "tinker-toy" games (making models of something - very good for creative objectives)
5. paper & pencil games (Tic-Tac-Toe)
6. mind-teaser games (word puzzles, riddles)
7. problem-solving games (Twenty Questions)
8. physical games (Charades)
9. acting games (role-playing, psychodrama, sociodramas)
10. simulations (mock UN, Gossip)

With a little practice and some creative thinking you can design games for behavioral objectives which have the following broad purposes:

1. to teach facts relevant to communication/theatre/language arts
2. to teach communication behaviors
3. to describe, explain, or predict communication behaviors
4. to develop, improve, or practice communication/dramatic/language arts behaviors
5. to observe communication behaviors
6. to test communication theories
7. to test communication models

8. to develop communication models
9. to develop communication theories
10. to explain a communication/theatrical process
11. to gain an understanding of a communication theory
12. to gain an understanding of communication behaviors
13. to gain an understanding of a communication process
14. to describe, study, or observe a communication process
15. to test cognitive knowledge in speech, theatre, or language arts
16. to give practice in psychomotor skills
17. to provide practice in acquiring content for lower level types of learning and reproductive objectives
18. to encourage principle applying (TL-7) and problem solving (TL-8) behaviors
19. to provide opportunities for meeting productive objectives

In addition to making learning fun by playing carefully designed educational games, the actual designing of games can become an educational activity. Students can be motivated to learn material in a content area if their reward is making a game for the teacher to use as a review technique over a unit. Some of my students have used this idea during their student teaching. Obviously, the game design techniques described here would have to be simplified for use by the high school student.

The unique aspect of the procedure I have described for developing educational games lies in the use of behavioral objectives matched with specific levels of learning. It is my firm belief that games designed in this fashion will be of greater value to the student. Moreover, I think the classroom teacher will find that the games he has developed for his students will more closely fit the needs of his students.

Footnotes

[1]James S. Coleman, Samuel A. Livingston, Gail M. Fennessey, Keith J. Edwards, and Steven Kidder, "The Hopkins Game Program: Conclusion from Seven Years of Research", Educational Researcher, August, 1973, p. 3.

[2]Coleman, P. 7.

[3]Coleman, p. 7.

[4]See Robert Kibler, Donald Cegala, Larry Barker, and David Miles, Objectives For Evaluation and Instruction (Boston: Allyn and Bacon, 1974) for a detailed explanation of how to write behavioral objectives.

[5]See Robert Gagné, The Conditions of Learning (N.Y.: Holt, Rinehart and Winston, Inc., 1970) for a complete explanation and examples of his levels of learning.

[6]See Leslie J. Briggs, Handbook of Procedures for the Design of Instruction (Pittsburgh, Pa.: American Institutes for Research, 1970), p. 63-67 for an explanation of how criterion-referenced grading differs from norm-referenced grading.

[7]Terri Terescavage and Arlie Parks, "Teaching Tip of the Day", Talk Back, 1, No. 2 (November, 1974), 1-2.

[8]See Gagné, p. 62-66 for a listing of the eight types of learning (TL). See Briggs, p. 24 for an explanation of productive and reproductive learning. See Kibler, p. 32-62, for examples

of properly worded behavioral objectives; and p. 66-67 for an explanation of entering (entry) behavior.

[9]See John P. DeCecco, The Psychology of Learning and Instruction: Educational Psychology (N.J.: Prentice-Hall, 1968), p. 490-92 for an explanation of pre-tests.

[10]See DeCecceo, p. 618-55 for an explanation of post-tests.

[11]The specifications are outlined in the remainder of this paper.

[12]See DeCecco, p. 641-45 for information on using reliability and validity checks.